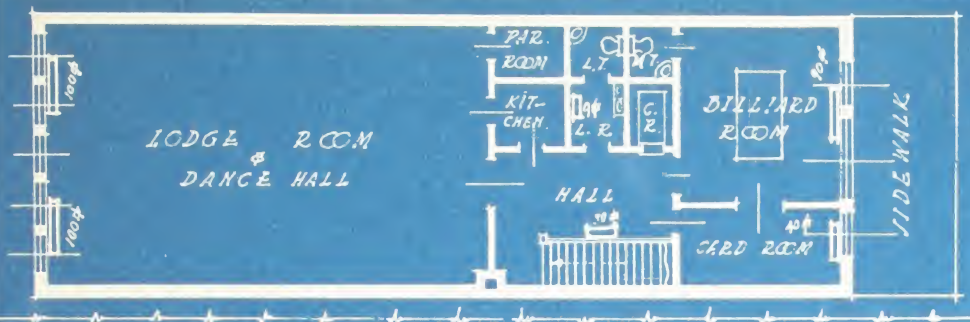
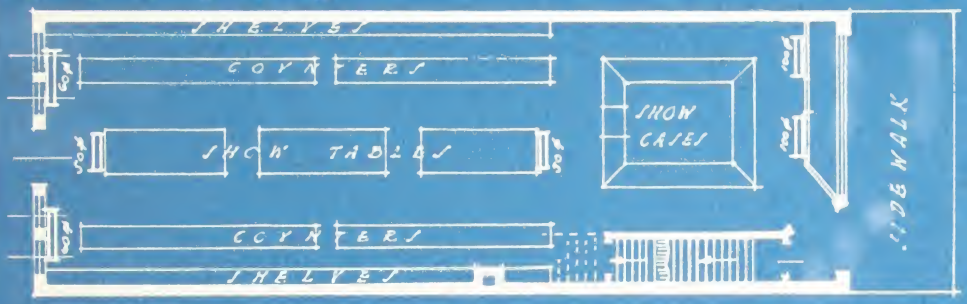
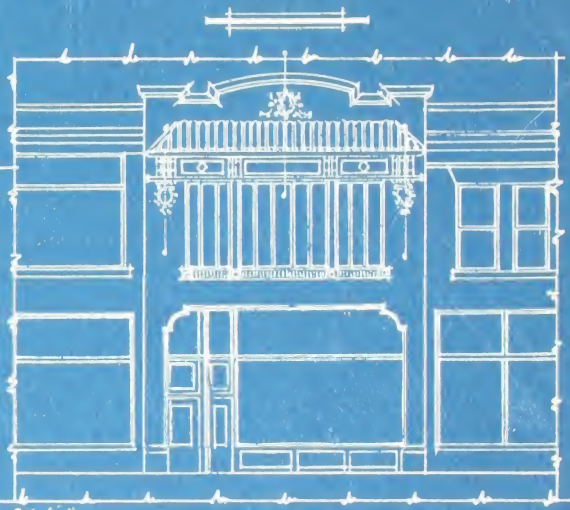
PLAN NUMBER FOUR
A STORE BUILDING
PROTECTED ON TWO SIDES



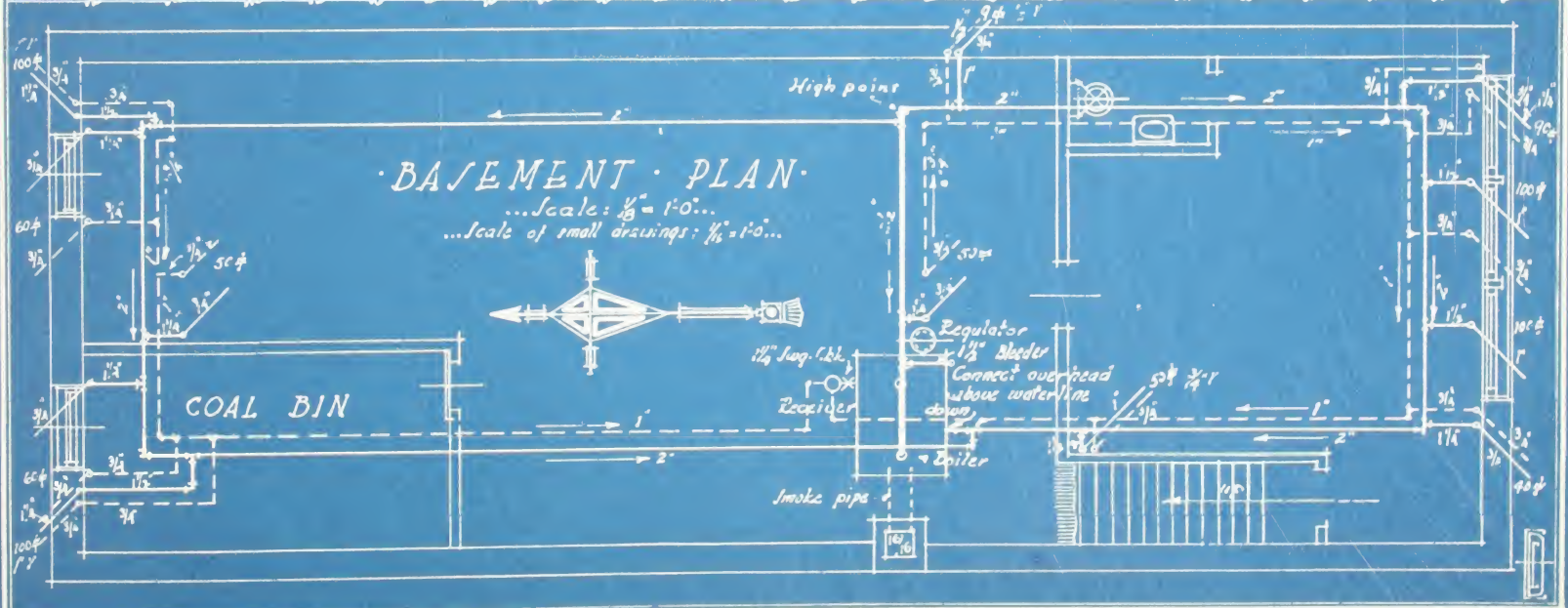




BASEMENT PLAN

...Scale: 1/8" = 1'-0"...

...Scale of small drawings: 1/16" = 1'-0"...



DATA
FOR
HEATING ENGINEERS
AND
ARCHITECTS
FOR THE DESIGN OF
VAPOR HEATING SYSTEMS

THE TRANE COMPANY
LA CROSSE
WISCONSIN

INTRODUCTORY

THE PURPOSE OF THIS BOOK IS TO PLACE IN THE HANDS OF ARCHITECTS AND ENGINEERS RELIABLE DATA AND INFORMATION FOR USE IN PLANNING AND DESIGNING VAPOR HEATING SYSTEMS.

THE MANY ADVANTAGES OF STEAM AT ATMOSPHERIC PRESSURE AS A MEDIUM OF HEAT TRANSMISSION HAVE BEEN CONVINCINGLY DEMONSTRATED; PARTICULARLY IN THE DEVELOPMENTS OF RECENT YEARS; AND THE INFORMATION ON THE FOLLOWING PAGES IS NOT ONLY THE RESULT OF SCIENTIFIC CALCULATIONS AND LABORATORY TESTS ALONG THE LINES OF THE BEST ACCEPTED THEORIES IN HEATING ENGINEERING; BUT IS; AS WELL; THE DEVELOPMENT OF YEARS OF PRACTICAL EXPERIENCE WITH HEATING PROBLEMS OF EVERY KIND. ALL CALCULATIONS ARE BASED ON UNQUESTIONED HEATING AUTHORITIES; ADAPTED IN OUR OWN ENGINEERING DEPARTMENT TO THE PARTICULAR REQUIREMENTS OF VAPOR HEATING; AND THEIR CORRECTNESS AMPLY DEMONSTRATED IN THOUSANDS OF PRACTICAL APPLICATIONS.

NO UNIQUE OR FREAK FEATURES HAVE EVER BEEN CLAIMED FOR TRANE VAPOR HEATING. IT IS SIMPLE AND DIRECT; AND ITS CONTINUED SUCCESS MAY BE DIRECTLY ATTRIBUTED TO THE CORRECTNESS OF THE ENGINEERING PRINCIPALS UNDERLYING; NOT ONLY THE LAYOUTS RECOMMENDED FOR TRANE SYSTEMS BUT THE DESIGN AND MANUFACTURE OF TRANE VAPOR HEATING SPECIALTIES.

THE TRANE COMPANY

ALLOWANCES AND ADDITIONS FOR RADIATION

PERCENT OF RADIATION TO BE ADDED TO CALCULATED AMOUNT AS FOUND IN TABLE No. 1.

FOR NORTH & NORTHWEST EXPOSURE: 10% NORTHEAST & WEST EXPOSURE: 7%; ROOMS WITH A FIREPLACE: 10%; RADIATION UNDER SEATS: 20%. FLOORS & CEILINGS EXPOSED TO WEATHER TO BE FIGURED AS WALL: FLOORS AND CEILINGS EXPOSED TO UNHEATED ROOMS TO BE FIGURED AS ½ WALL: CEILINGS IN ONE STORY COTTAGES TO BE FIGURED AS ½ WALL OPEN PRINCIPAL ROOMS WITH LARGE OPEN HALLWAY LEADING TO 2ND FLOOR ADD AT LEAST 20%.

BATH ROOMS FIGURING 10 SQ. FT. OR LESS ADD 100%. LARGER BATHS SHOULD BE INCREASED 25%.

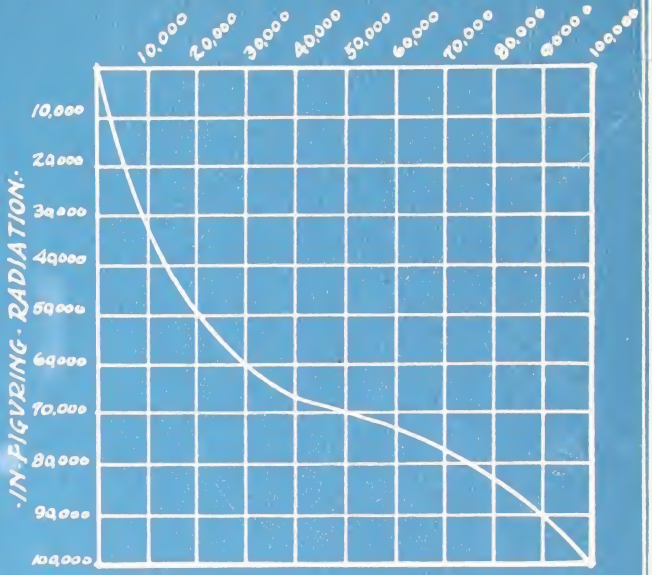
LONG NARROW STORES EXPOSED ON NARROW ENDS ONLY, WITH 2ND FLOOR HEATED FIGURE ½ CONTENTS. LONG NARROW STORES EXPOSED ON 3 OR 4 SIDES; DOUBLE CONTENTS.

SCHOOL ROOMS NOT VENTILATED DOUBLE CONTENTS. WHEN DIRECT INDIRECT IS USED ADD 35%. WHEN INDIRECT IS USED ADD AT LEAST 75%.

FOR CHURCHES FIGURE ENTIRE ROOF AS WALL: FIGURE CONTENTS & WE CHART TO OBTAIN CONTENTS TO BE FIGURED FROM ACTUAL CONTENTS. CHART SHOWS THAT CONTENTS SHOULD BE INCREASED IN ALL CHURCHES WITH LESS THAN 90000 Cu Ft. EX.— IN A CHURCH WITH 30 000 CU. FT. USE 60,000 CU. FT. AS CONTENTS TO BE FIGURED.

CUBIC CONTENTS TO BE USED IN FIGURING RADIATION.

ACTUAL CUBIC CONTENTS



EXAMPLES FOR USING TABLES No. 1, 2 AND ADDITIONS.

1. FIND RADIATION REQUIRED FOR A N.W. ROOM TO BE HEATED TO 70° AT 10° BELOW ZERO. CONTENTS— 1440 CU. FT., GLASS—60 SQ. FT., WALL — 200 SQ. FT.

SEE TABLE No. 1 — COLUMN HEADED (-10)

$\frac{1440}{158} = 9.12$. $\frac{200}{8.3} = 21.5$ $\frac{60}{2.88} = 20.82$.

9.12 + 21.5 + 20.82 = 51.44.

ADD 10% FOR N.W. EXPOSURE.

51.44 + 5.144 = 56.58 or 57 SQ. FT.

2. FIND RADIATION TO HEAT ABOVE ROOM TO 80° AT 10° BELOW ZERO.

WE FOUND 57 SQ. FT. REQUIRED FOR 70°: IN TABLE NO. 2 IN COLUMN HEADED (-10) OPPOSITE (80°), WE FIND 1.21.

57 X 1.21 = 69 SQ. FT. REQUIRED.

SUPPLY PIPE SIZES

FIRST DETERMINE THE TOTAL LENGTH OF MAIN SUPPLY PIPE; ADDING TO THIS LENGTH ADDITIONS FOR 90 AND 45° ELBOWS AND TEES AS IN TABLE NO 1. COUNT ONLY THE TEES USED ON BEGINNING OF SEPARATE SUPPLY CIRCUITS. . . . .

TABLE 1

PIPE SIZE	LENGTH OF PIPE EQUIVILANT TO RESISTANCE											
	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8
90° ELL & TEE	3	3	5	6	8	10	13	16	19	23	29	33
45° ELBOW	2	2	3	3	4	5	6	8	10	13	15	17

AFTER DETERMINING THE TOTAL LENGTH WITH ADDITIONS; THE SIZE TO BE USED IS FOUND BY USING TABLE NUMBER 2 . . . . .

TABLE 2

SQUARE FEET OF RADIATION	MAXIMUM LENGTH OF MAIN IN FEET INCLUDING ADDITIONS FOR FITTINGS. (SEE TABLE NO 1.)									
	20'	30'	40'	60'	80'	100'	200'	400'	800'	1500'
	MAIN SIZES									
60	1¼"	1¼"	1¼"	1¼"	1½"	1½"	2"	2"	2"	2½"
100	1¼"	1½"	1½"	1½"	1½"	2"	2"	2"	2½"	2½"
200	1½"	1½"	1½"	1½"	2"	2"	2"	2½"	2½"	2½"
300	1½"	1½"	2"	2"	2"	2½"	2½"	2½"	2½"	3"
400	1½"	2"	2"	2"	2½"	2½"	2½"	2½"	3"	3"
600	2"	2½"	2½"	2½"	3"	3"	3"	3"	3"	3½"
800	2½"	2½"	3"	3"	3"	3"	3"	3½"	3½"	4"
1000	3"	3"	3"	3"	3"	3½"	3½"	4"	4"	4"
1300	3"	3"	3"	3½"	3½"	4"	4"	4"	4½"	4½"
1600	3½"	3½"	3½"	4"	4"	4"	4½"	4½"	4½"	5"
2000	4"	4"	4"	4"	4½"	4½"	4½"	4½"	5"	5"
2300	4½"	4½"	4½"	4½"	4½"	4½"	4½"	5"	5"	6
3000	4½"	4½"	4½"	5"	5"	5"	5"	6"	6"	6"
3500	5"	5"	5"	5"	5"	6"	6"	7"	7"	7"
4000	5"	6"	6"	6"	6"	6"	7"	7"	7"	7"
4500	6"	6"	6"	6"	6"	7"	7"	7"	7"	8"
5000	6"	6"	6"	6"	7"	7"	7"	7"	8"	8"
6000	6"	6"	7"	7"	7"	7"	7"	8"	8"	9"
8000	7"	7"	7"	7"	7"	8"	8"	8"	9"	9"
10,000	7"	7"	8"	8"	8"	9"	9"	9"	9"	10"

EXAMPLE:-TAKE 2500 ft OF RADIATION; LENGTH OF MAIN BEING 100 FEET WITH 3 - 90° AND 2 - 45° ELBOWS. USING TABLE NO 2 WE FIND THAT 4½" OR 5" ARE TO BE USED. IF 4½" ADD FOR ELBOWS 64 FEET OR A TOTAL OF 164 FEET. BY AGAIN USING TABLE NO 2 WE FIND 4½" TO BE THE CORRECT SIZE OF MAIN TO USE. . . . . .

RETURN MAINS

RADIATION	SIZE
0-100 SQUARE FEET	¾ INCH
100-400 " "	1 "
400-1200 " "	1¼ "
1200-1800 " "	1½ "
1800-2500 " "	2 "

RISER SIZES

ESTIMATE LENGTH OF MAIN FROM BOILER TO EACH RISER; USING TABLE NO 1 FOR ADDITIONS AND SELECT RISER FROM THAT COLUMN OF TABLE NO 3 CORESPONDING TO ESTIMATED LENGTH OF MAIN. RISER MAY BE REDUCED AS RADIATION IS TAKEN OFF (SEE SAME COLUMN).

TABLE 3

SQUARE FT OF RADIATION	MAXIMUM LENGTH OF MAIN IN FEET INCLUDING ADDITIONS FOR FITTINGS (SEE TABLE NO 1)													
	10	20	30	40	50	60	70	80	90	100	150	200	400	800
	RISER SIZES ABOVE FIRST FLOOR													
20	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	1"	1"	1"	1"	1"	1"
35	3/4"	3/4	3/4	3/4	3/4	3/4	1	1	1	1	1	1 1/4	1 1/4	1 1/4
45	3/4	3/4	3/4	1	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4
55	1	1	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2
80	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2
99	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2
110	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	2	2	2
150	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2
200	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2
300	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2	2	2 1/2	2 1/2	2 1/2	3
400	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3
500	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3
600	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3 1/2
700	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3 1/2	3 1/2
800	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3 1/2	3 1/2	3 1/2
900	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3	3 1/2	3 1/2	3 1/2	3 1/2
1000	2 1/2	2 1/2	2 1/2	3	3	3	3	3	3	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2

RETURN RISERS

RADIATION	SIZE
0 - 100 SQUARE FEET	3/4 INCH
100 - 300 " "	1 "
300 - 600 " "	1 1/4 "
600 - 1200 " "	1 1/2 "

REDUCTIONS MAY BE MADE ACCORDING TO TABLE AS RADIATION IS TAKEN OFF.

LATERALS OR SUPPLY ARMS

3/4" AND 1" RISERS TAKE SUPPLY ARMS TWO SIZES LARGER. LARGER RISERS TO BE INCREASED ONE SIZE. NB: STUBS FOR FIRST FLOOR RADIATORS TO BE SAME SIZE AS VALVES EXCEPT WHERE RADIATORS ARE 100 SQ FT OR OVER AND REQUIRE 1 1/4" OR LARGER STUB ACCORDING TO TABLE NO 3. SUCH RADIATORS TO HAVE 1 1/4" STUB AND A REDUCER AT THE 1" VALVE.

HOW TO SELECT BOILER SIZE

ROVND BOILERS

TO BE ABSOLVTELY LIBERAL ON ROVND CAST IRON BOILERS, ADD 20% FOR HEAT LOSS IN PIPING AND 40-50% OF THE SVM FOR EXCESS. SELECT LOWEST BOILER IN A SERIES FOR SOFT COAL AND A LOW CHIMNEY. WITH A 35-40 FOOT CHIMNEY, THE SECOND IN THE SERIES MAY BE VSED. FOR HARD COAL, THE SECOND IN THE SERIES IS GOOD; THE HIGHEST IN THE SERIES IS ONLY GOOD FOR ESPECIALLY HIGH CHIMNEYS.

SQVARE BOILERS

AVOID LONG BOILERS. SOFT COAL IS VSVALLY BVRNED IN SQVARE BOILERS. HENCE IT IS WELL TO BE A LITTLE MORE LIBERAL WITH THE SIZE.

STEEL BOILERS

FIRE BOX BOILERS ARE RATED TO CARRY THEIR ACTVAL RADIATING SVRFACE AND IN SELECTING THE SIZE 25-30% EXCESS IS SVFFICIENT.

DOWNDRAFT BOILERS

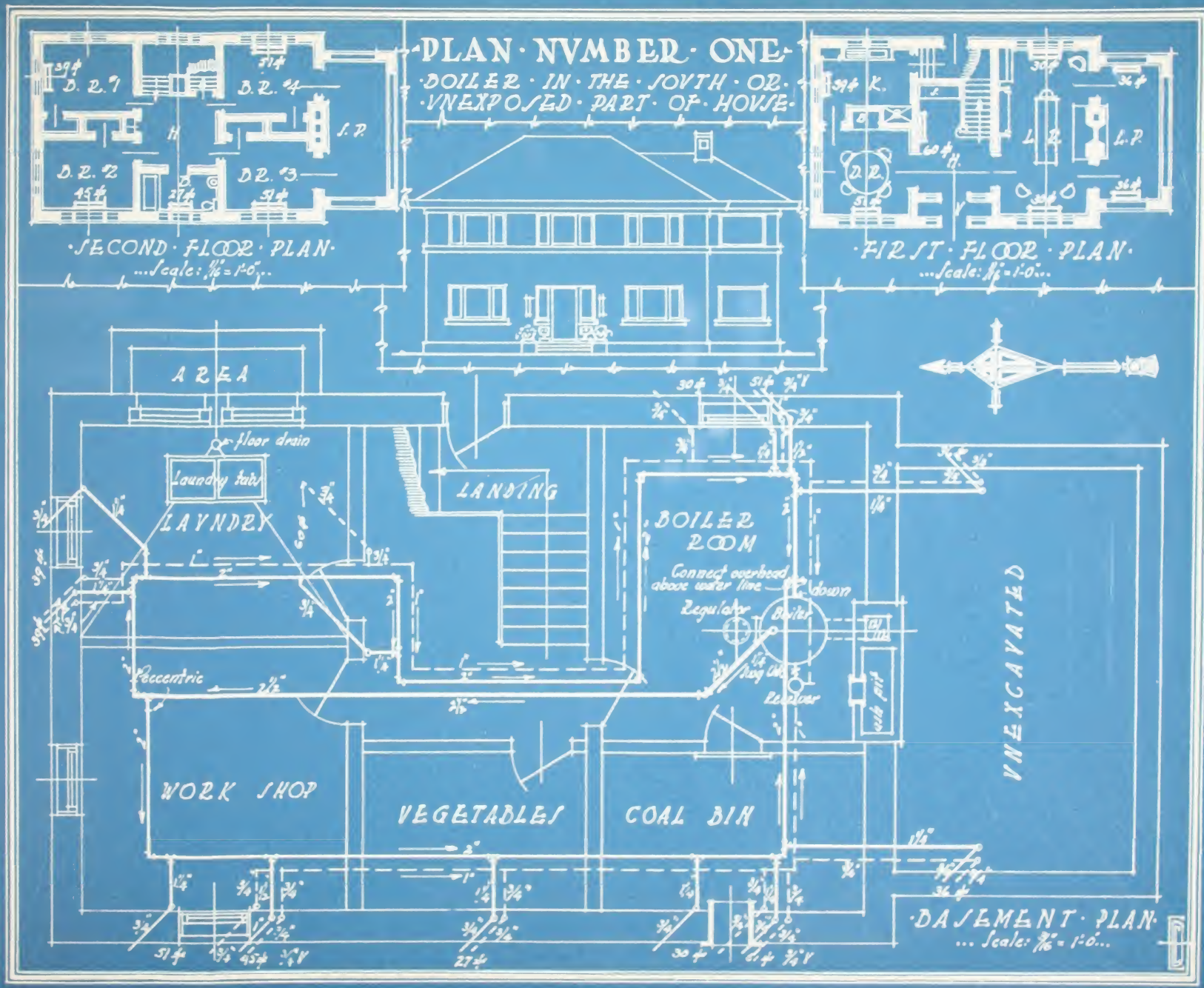
SPECIAL ATTENTION MVST BE PAID TO HEIGHT AND SIZE OF CHIMNEY. VSE MANVFACTVRER'S RECOMMENDATIONS.

CHIMNEYS

VSE MANVFACTVRER'S SIZES. MANY RESIDENCES ARE SPOILED BY 8"x12" FLVES. ORDINARY 8-10 ROOM HOVSES REQVIRE 12"x12" FLVES.

A METHOD FOR SELECTING THE PROPER LAYOVT

MOST ALL INSTALLATIONS CAN BE CORRECTLY DESIGNED ACCORDING TO ONE OF THE TWO GENERAL PLANS, DEPENDING VPON THE LOCATION OF THE BOILER WITH REFERENCE TO THE PRINCIPAL EXPOSVRES AS SHOWN ON PLANS ONE AND TWO.


PLAN · NVMBER · ONE
·BOILER · IN · THE · SOVTH · OR·
·VNEXPOSED · PART · OF · HOVSE·
·SECOND · FLOOR · PLAN·
...Scale: 1/8"=1'-0"..
·FIRST · FLOOR · PLAN·
...Scale: 1/8"=1'-0"...
D. R. 1
D. R. 4
D. R. 2
D. R. 3
H
S. P.
K.
L. R.
L. P.
D. R.
AREA
floor drain
Laundry tubs
LAVNDRY
LANDING
BOILER ROOM
Connect overhead above water line
down
Regulator
Boiler
Eccentric
Ash pit
Ash door
WORK SHOP
VEGETABLES
COAL BIN
VNEXCAVATED
·BASEMENT · PLAN·
... Scale: 3/16"=1'-0"...

PLAN · NVMBER · TWO

·BOILER · IN · THE · NORTH · OR · EXPOSED · PART · OF · HOVSE·

·SECOND · FLOOR · PLAN·

...Scale: 1/16 = 1-0"...

·FIRST · FLOOR · PLAN·

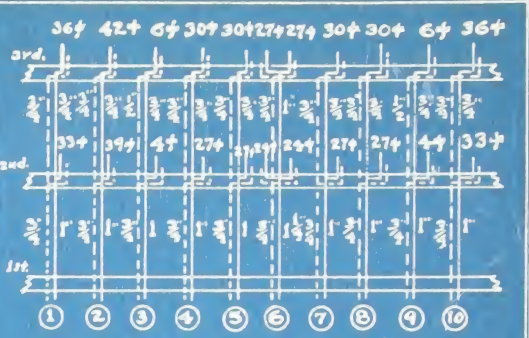
...Scale: 1/16 = 1-0"...

·BASEMENT · PLAN·

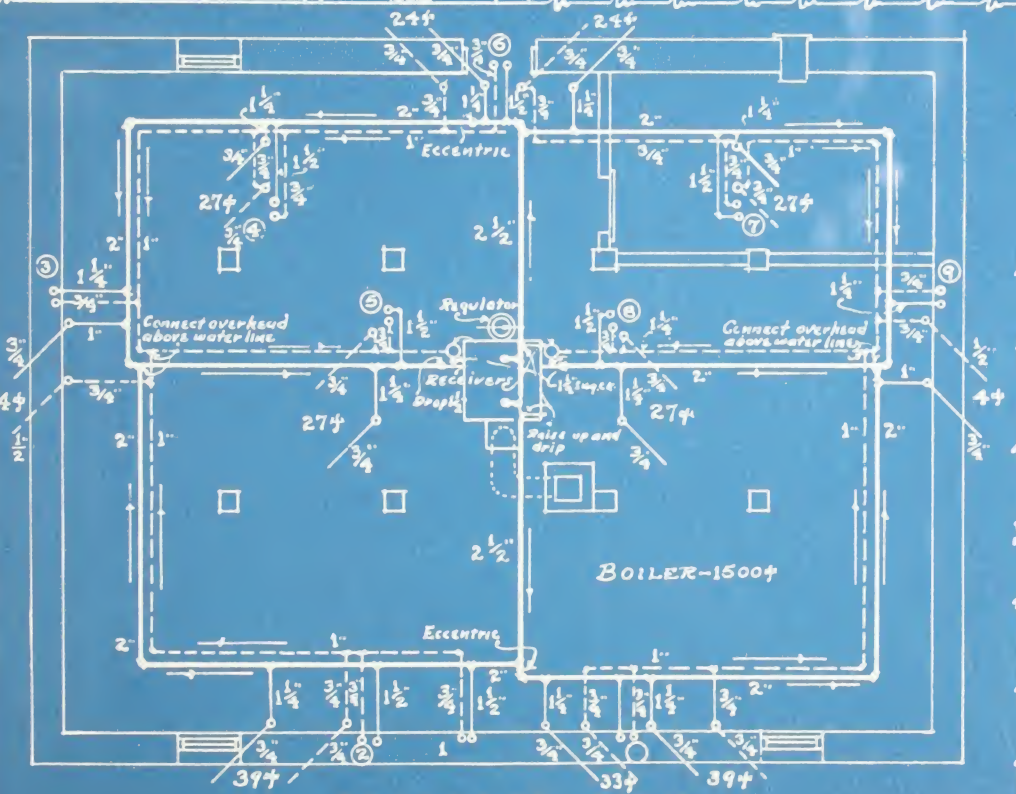
...Scale: 1/16 = 1-0"...

PLAN NUMBER THREE
AN APARTMENT BLDG

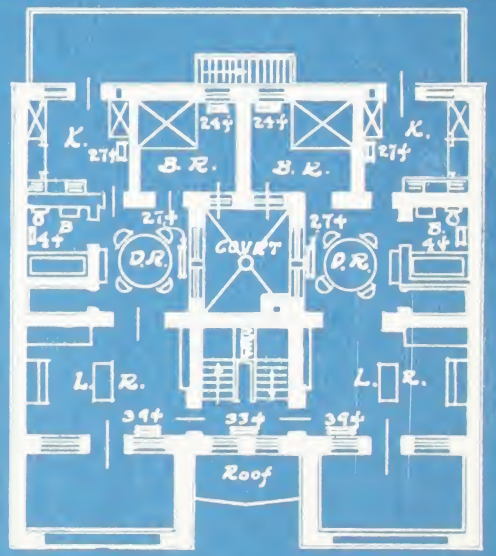
NOTE THAT THIS IS A COMBINATION OF TWO LAYOUTS LIKE PLAN NUMBER TWO



RISER DIAGRAM
Scale: 1/16" = 1'0"

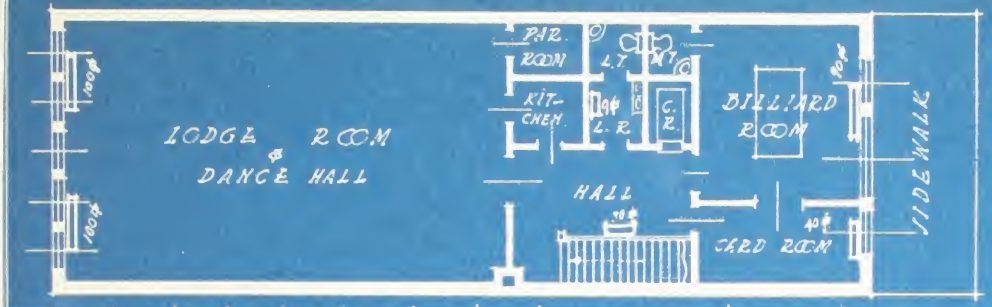


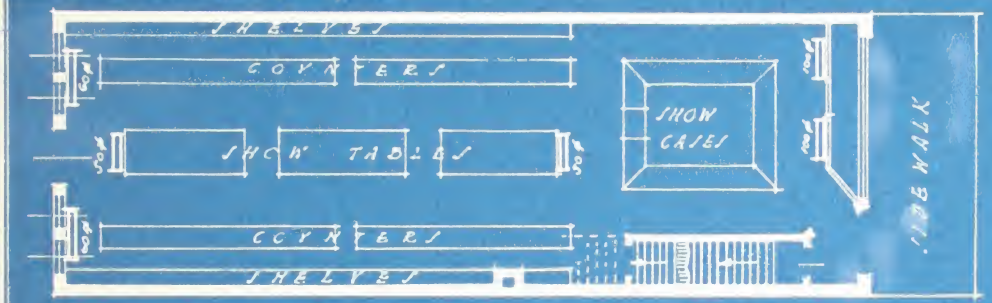
BASEMENT PLAN
Scale: 1/8" = 1'0"



SECOND FLOOR PLAN
Scale: 1/16" = 1'0"

PLAN NUMBER FOUR
A STORE BUILDING
PROTECTED ON TWO SIDES

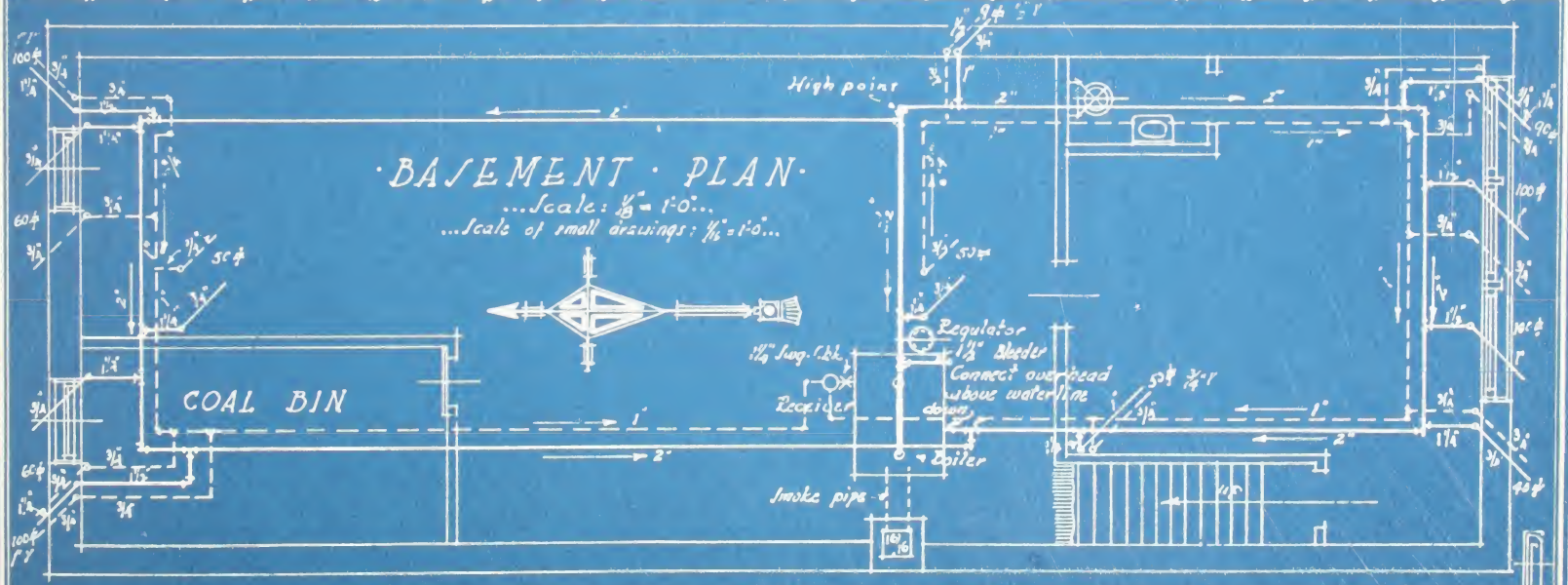




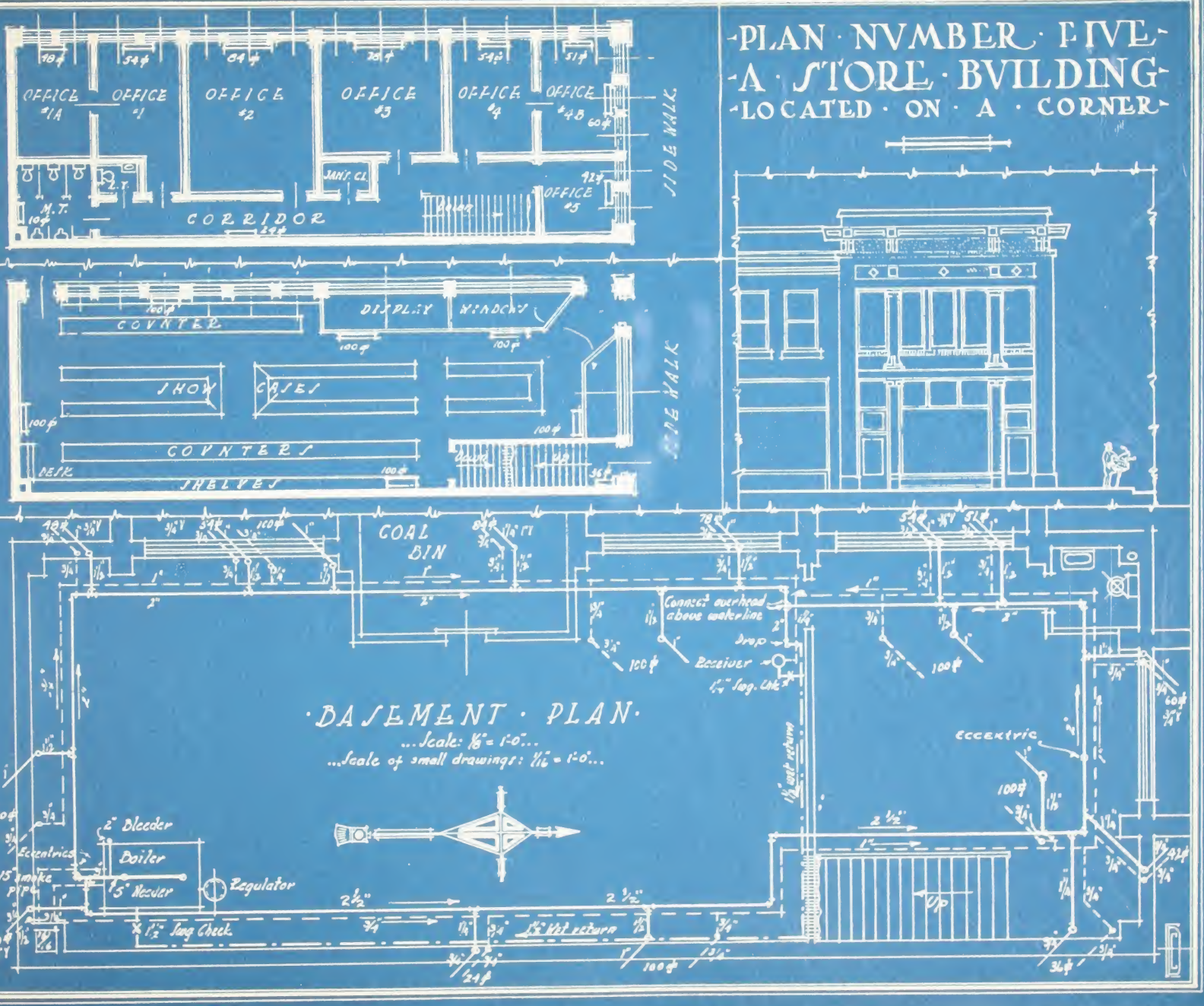
BASEMENT PLAN

...Scale: ⅛" = 1'-0"...

...Scale of small drawings: 1/16" = 1'-0"...

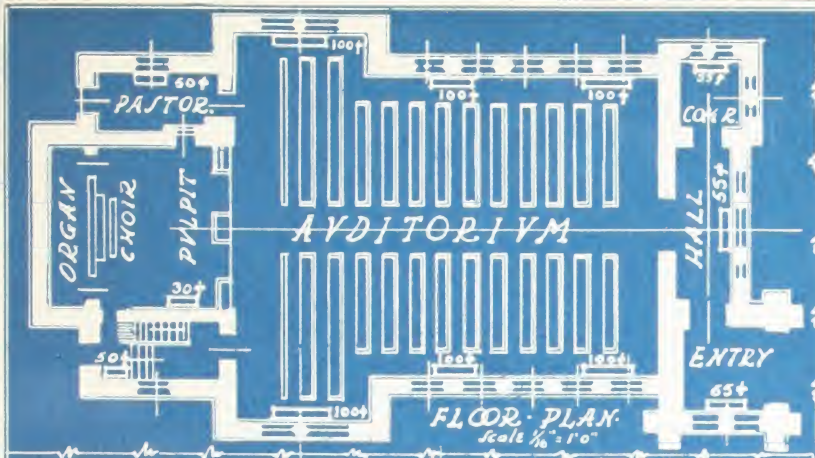


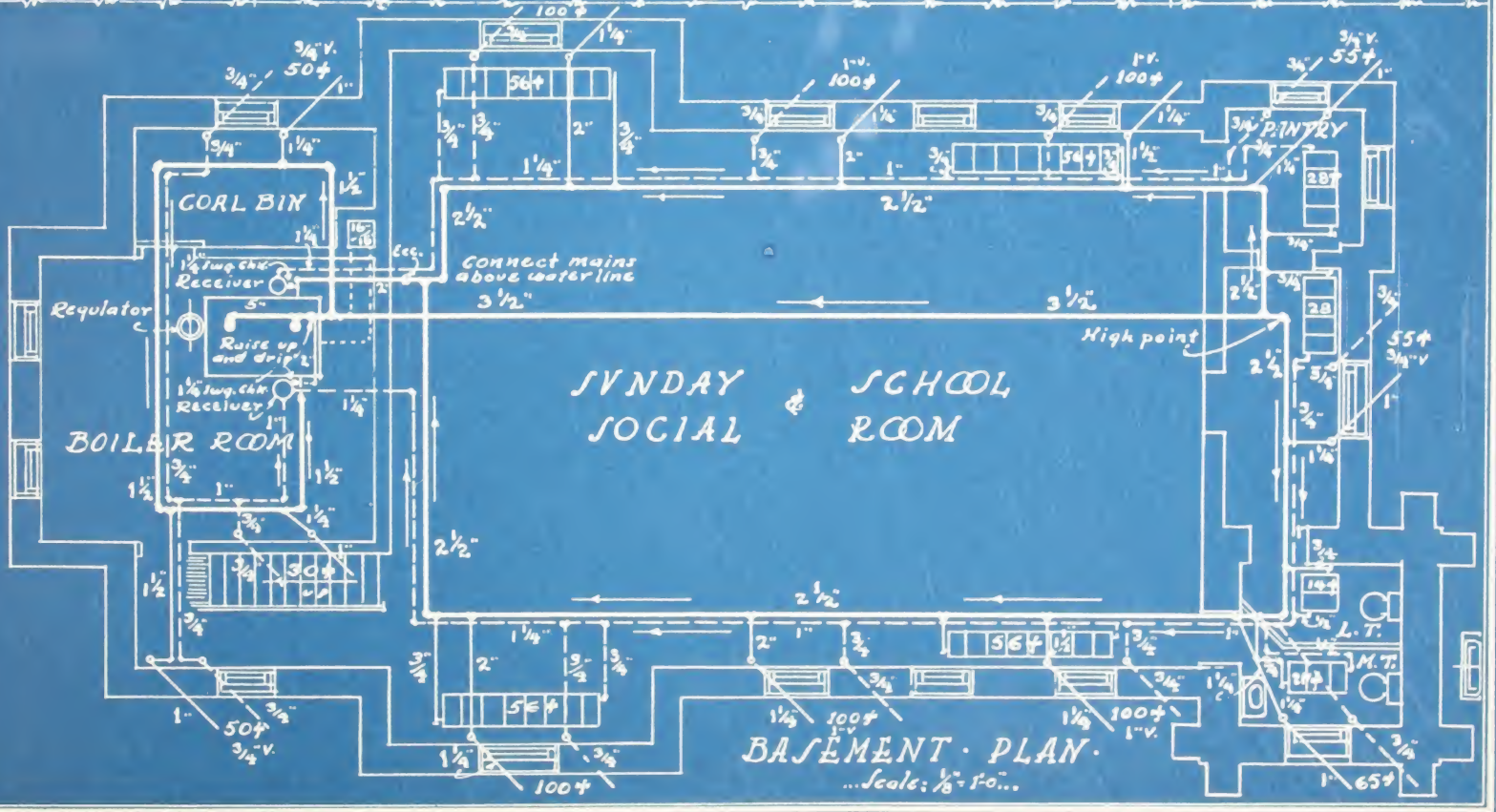
PLAN NUMBER FIVE
A STORE BUILDING
LOCATED ON A CORNER



PLAN NO SIX
A CHURCH

NOTE THE USE OF THREE CIRCUITS IN THIS LAYOUT





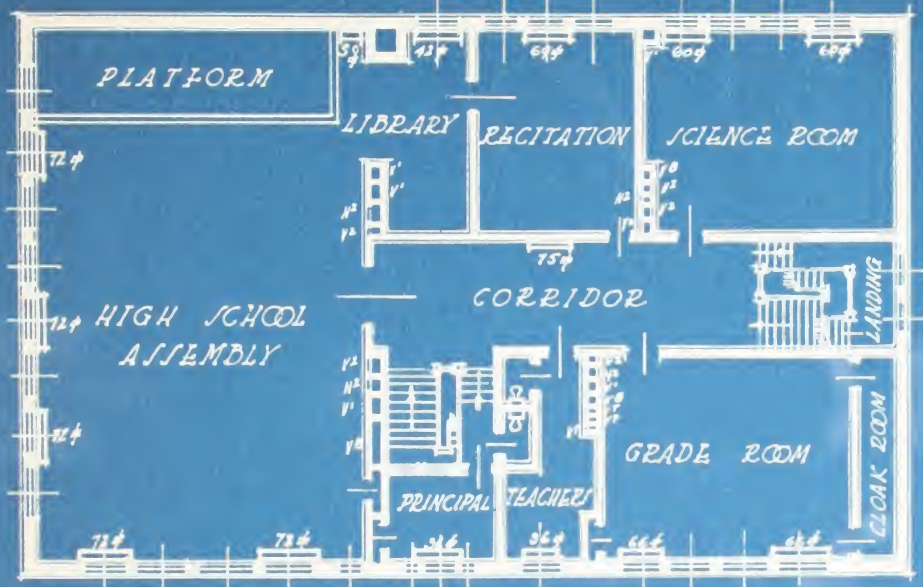
SHEET NYMBER ONE

PLAN · NVMBER · SEVEN

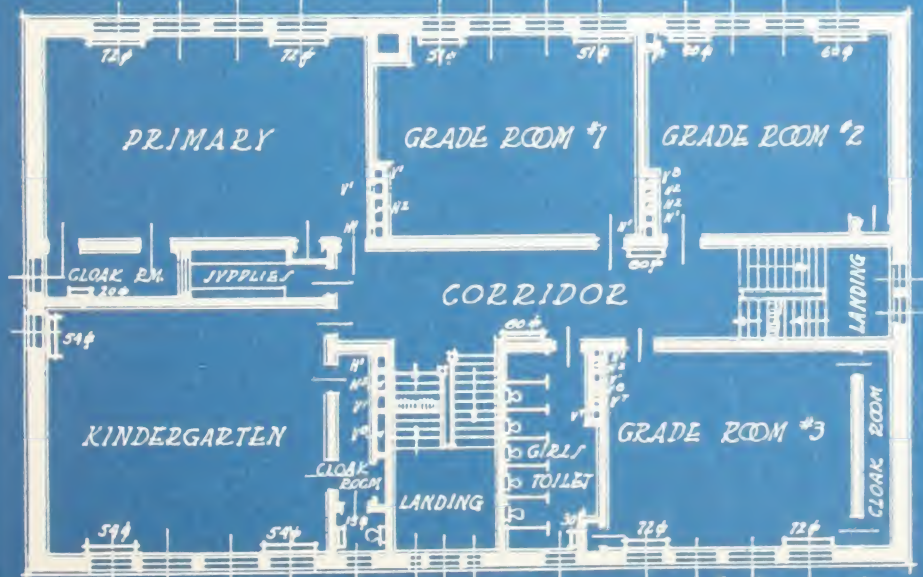
A SCHOOL BVILDING

SHOWING · THE · VSE · OF · A · FAN · SYSTEM · IN · COMBINATION · WITH · DIRECT · RADIATION ·

REDRAWN · FROM · AN · INSTALLATION ·



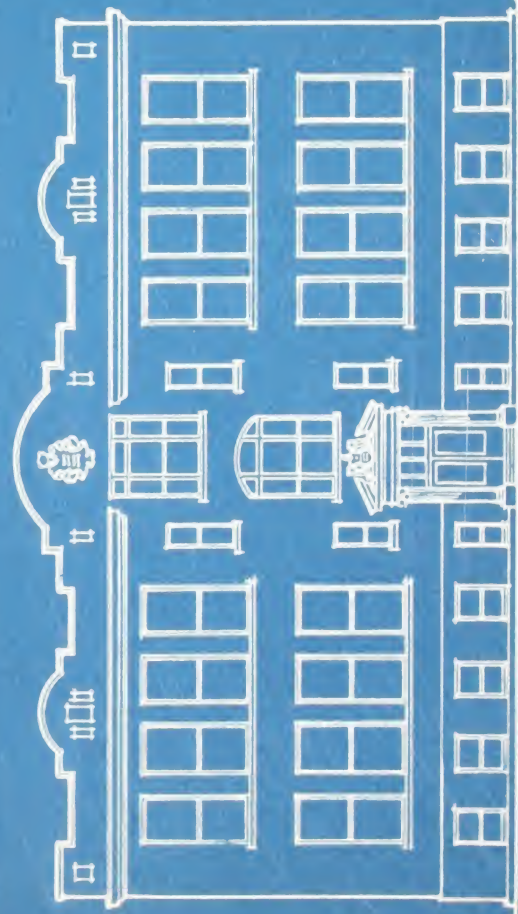
SECOND · FLOOR · PLAN

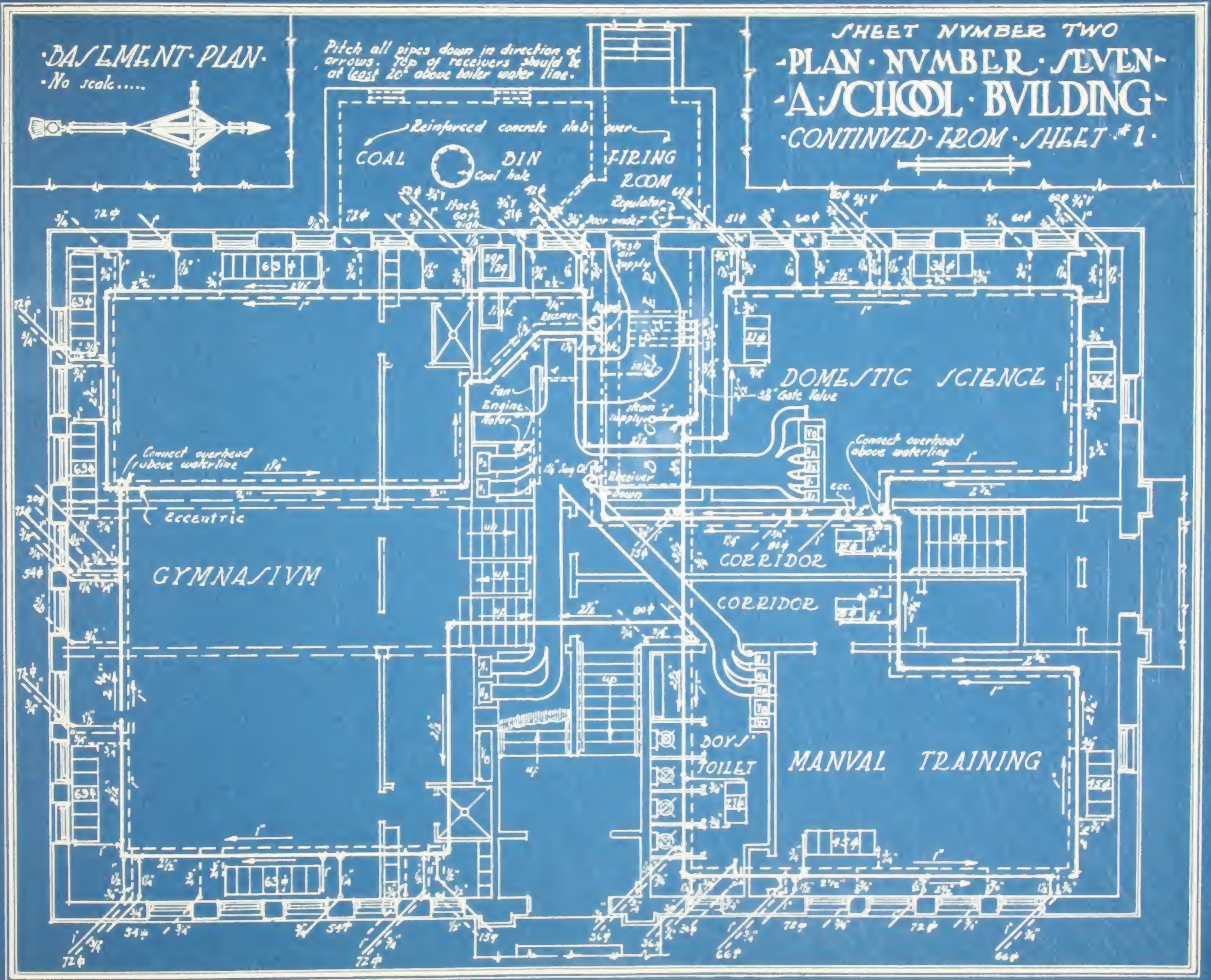


Scale for all drawings on this sheet: 1/16" = 1'-0"

FIRST · FLOOR · PLAN

For Basement Plan see following sheet

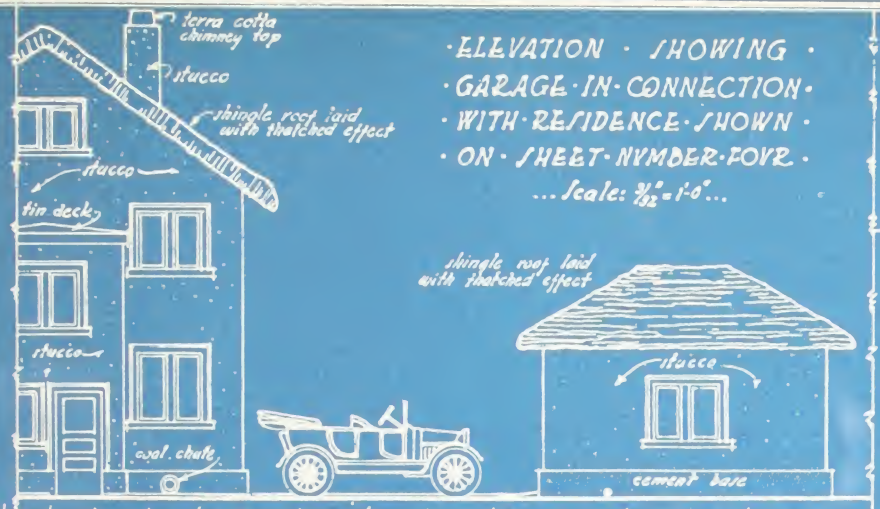




BASEMENT PLAN
No scale.....
Pitch all pipes down in direction of arrows. Top of receivers should be at least 20" above boiler water line.
SHEET NUMBER TWO
PLAN NUMBER SEVEN
A SCHOOL BUILDING
CONTINUED FROM SHEET #1
Reinforced concrete slab over
COAL BIN
Coal hole
FIRING ROOM
Regulator
Fresh air supply
Fan
Engine
Motor
Receiver
Steam supply
Gate Valve
Connect overhead above waterline
Eccentric
GYMNASIUM
DOMESTIC SCIENCE
CORRIDOR
CORRIDOR
BOYS' TOILET
MANUAL TRAINING

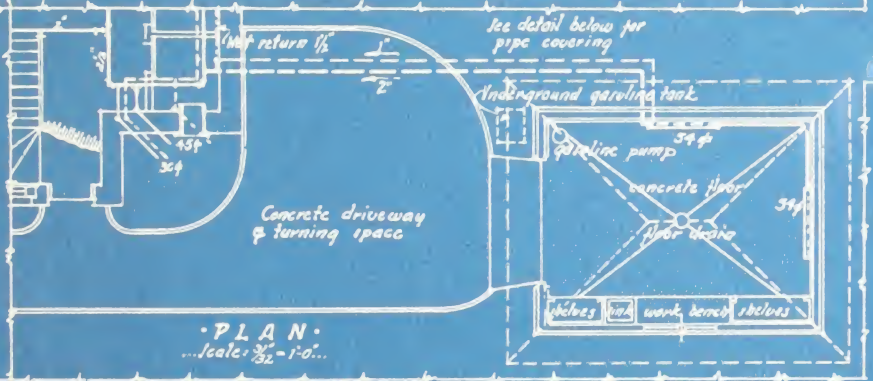
PLAN NVMBER EIGHT
A DISCONNECTED GARAGE

SEE ALSO PLAN NVMBER TWO. SHEET FOVR

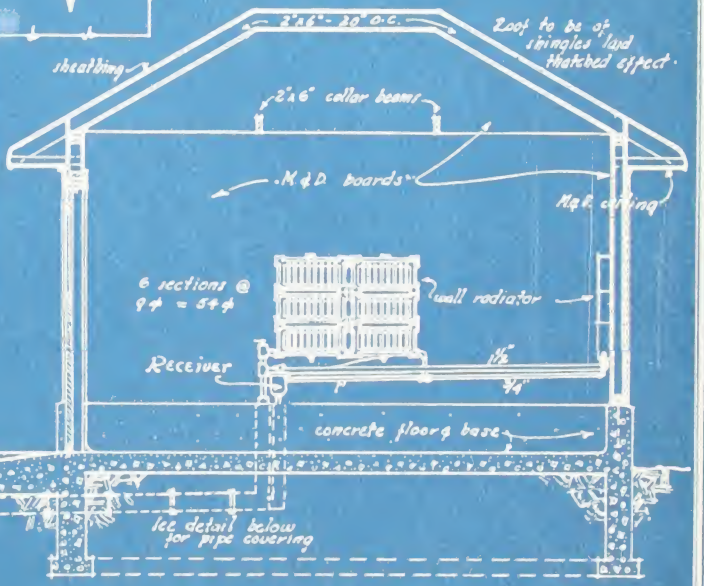


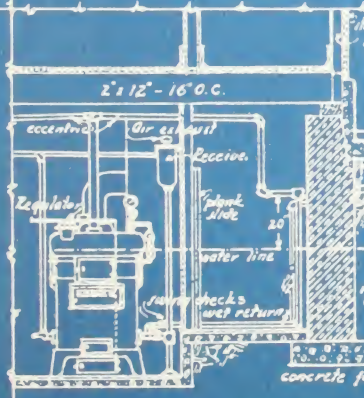
ELEVATION SHOWING GARAGE IN CONNECTION WITH RESIDENCE SHOWN ON SHEET NVMBER FOVR
... Scale: 3/32" = 1'-0" ...

PIPES PASSING VNDERGROVND MVST BE AT LEAST EIGHTEEN INCHES ABOVE WATERLINE OF BOILER. SELECT LOW WATER LINE BOILER. VSVALLY A PIT IS REQVIRED VNLESS A CONDENSATION PVMP IS VSED AS SHOWN ON FOLLOWING SHEET



PLAN
... Scale: 3/32" = 1'-0" ...





SECTION
... Scale: 3/16" = 1'-0" ...

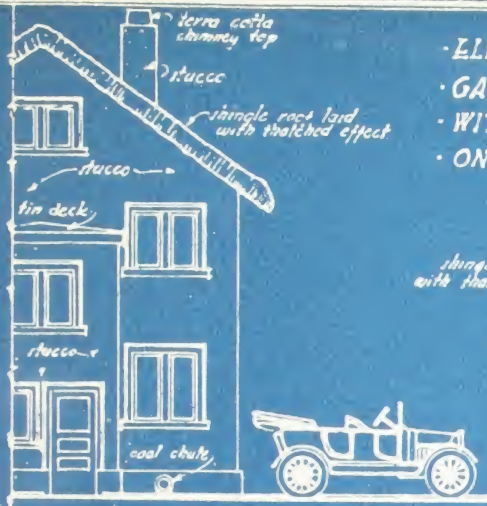
DETAIL OF PIPE COVERING
... Scale: 3/4" = 1'-0" ...

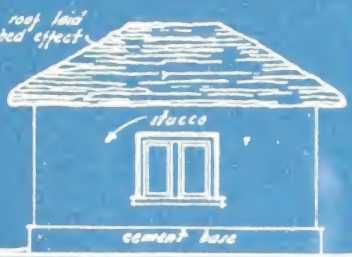
WHERE GARAGE IS MORE THAN 35 FT. AWAY FROM HOVSE, PITCH SVPPLY DOWN TO WITHIN 20 FT. OF GARAGE AND BLEED INTO WET RETVRN.

PLAN · NVMBER · NINE ·
A · DISCONNECTED · GARAGE

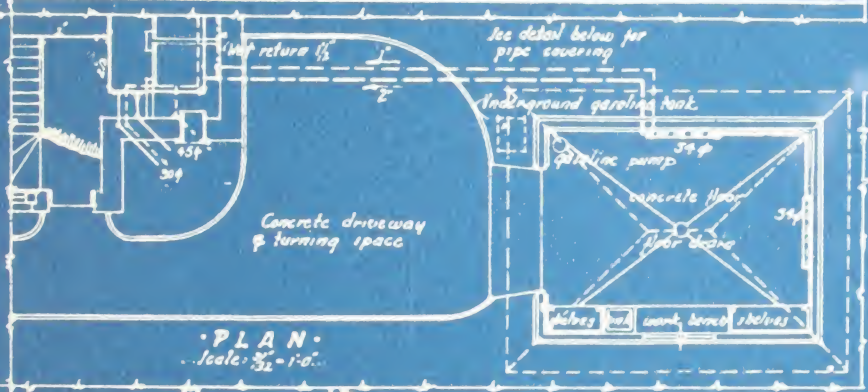
·SEE · ALSO · PLAN · NVMBER · TWO. · SHEET · FOVR ·

·ELEVATION · SHOWING ·
·GARAGE · IN · CONNECTION ·
·WITH · RESIDENCE · SHOWN ·
· ON · SHEET · NVMBER · FOVR ·
...Scale: 1/32" = 1'-0"...

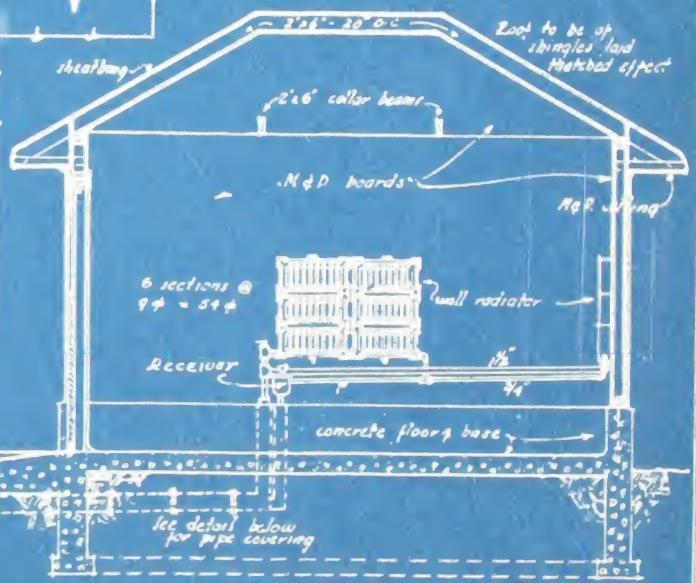


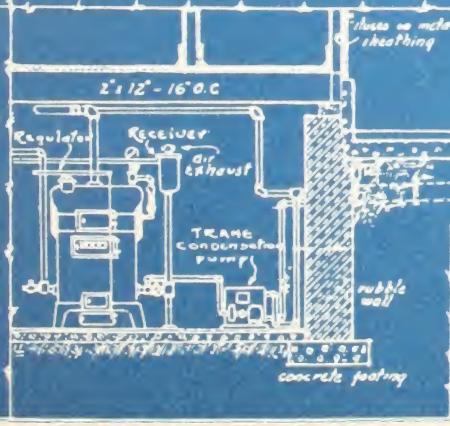


·DY · INSTALLING · A · TRANE ·
·AVTOMATIC · ELECTRIC · CON-
·DENSATION · PVMP, · VNDER-
·GROVND · PIPING · CAN · BE ·
·RVN · EVEN · BELOW · WATER ·
·LINE, · THVS · DOING · AWAY ·
·WITH · PITTING · OF · BOILERS ·

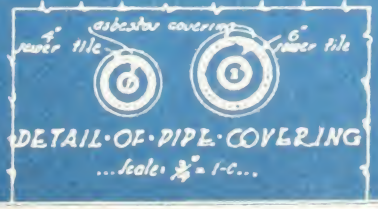


·PLAN·
...Scale: 1/32" = 1'-0"...





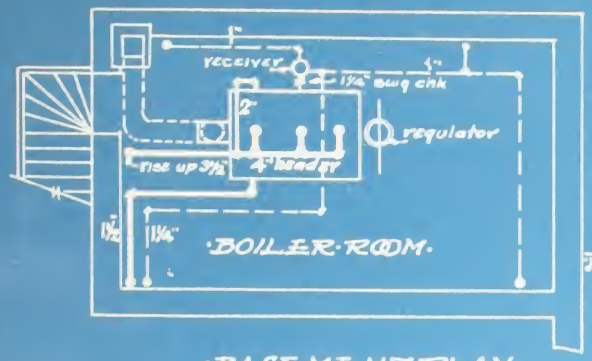
·SECTION·
...Scale: 3/16" = 1'-0"...



DETAIL · OF · PIPE · COVERING
...Scale: 3/4" = 1'-0"...

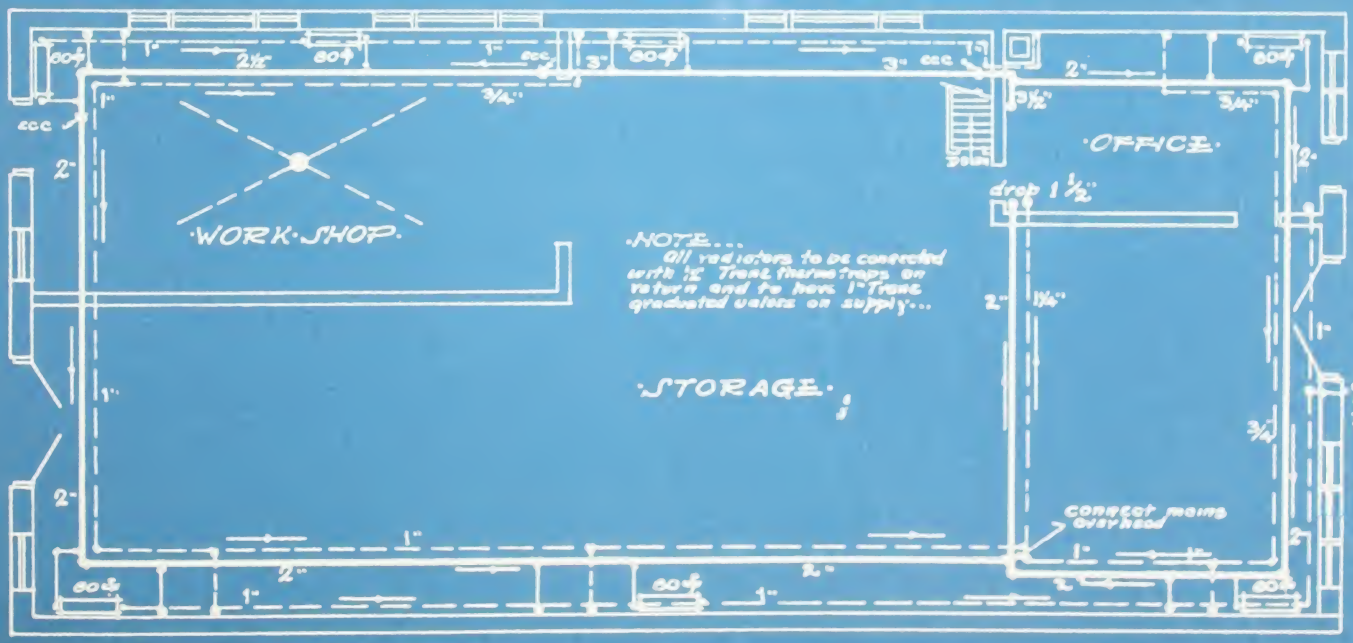
·WHERE · GARAGE · IS · MORE · THAN · 35 · FT. ·
·AWAY · FROM · HOVSE, · PITCH · SVPPLY ·
·DOWN · TO · WITHIN · 20 · FT. · OF · GARAGE ·
·AND · BLEED · INTO · WET · RETVRN. ·

·PLAN · NVMBER · TEN·
·A·GARAGE · BVILDING·

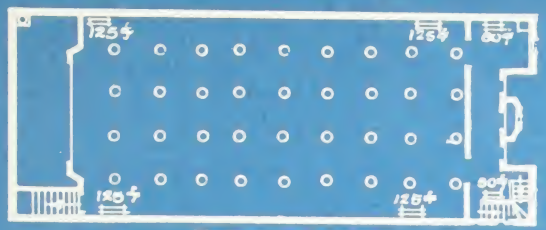


·BASEMENT·PLAN·
...scale: ⅛"=1'0"...

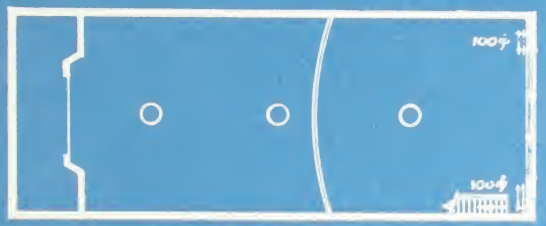
·BASEMENT·IN·
·ONE·CORNER·
·OVERHEAD·
PIPING·SYSTEM·



PLAN NUMBER ELEVEN
THEATRE BUILDING

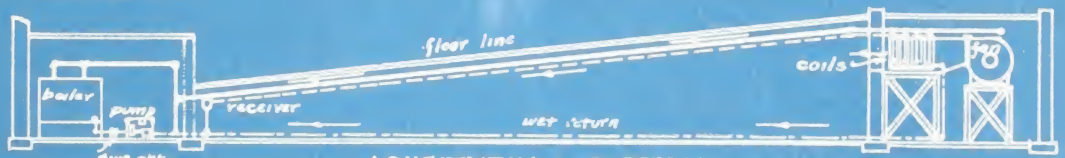


FIRST FLOOR
Scale: 1/32" = 1'0"

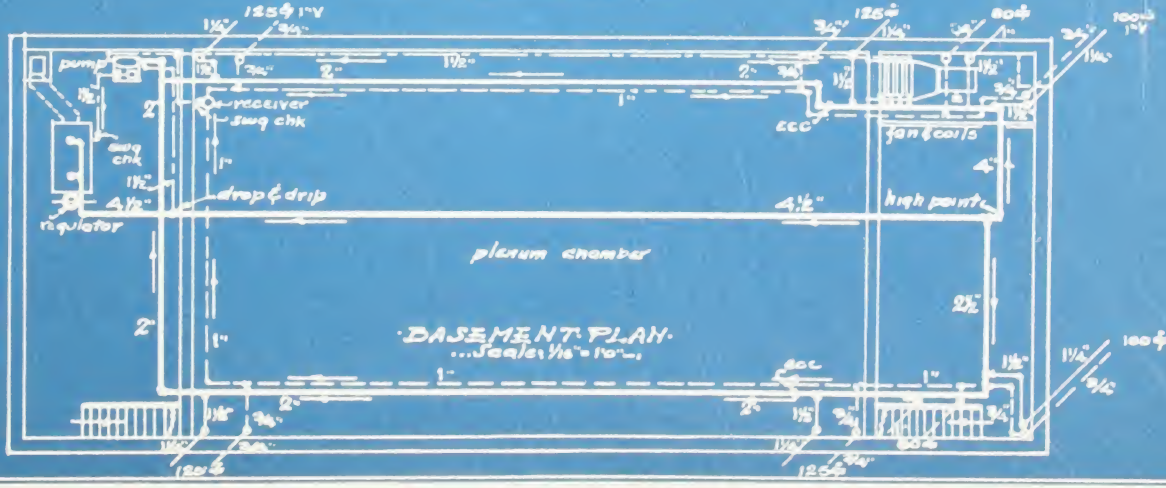


BALCONY
Scale: 1/32" = 1'0"

FRONT ELEVATION
Scale: 1/32" = 1'0"

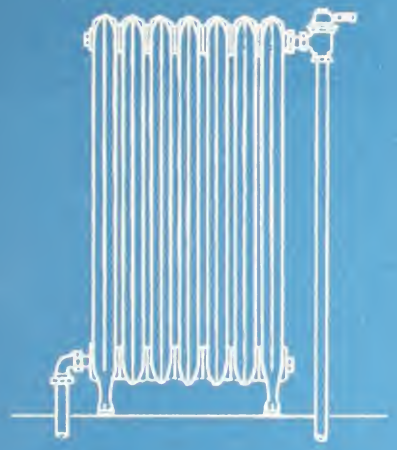


LONGITUDINAL SECTION

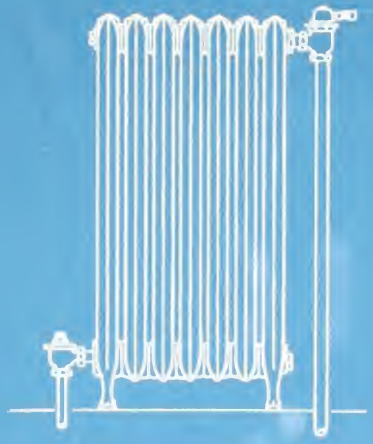


BASEMENT PLAN
Scale: 1/16" = 1'0"

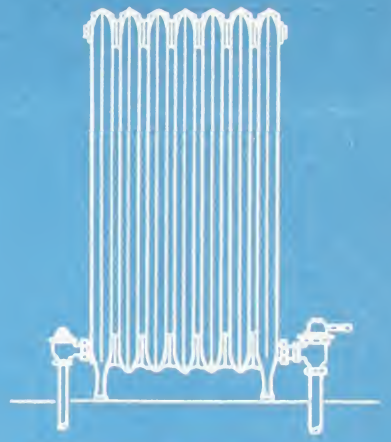
TYPICAL RADIATOR CONNECTIONS



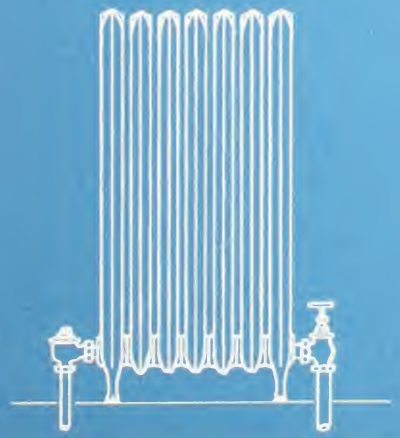
STANDARD VALVE AND RETURN FITTING CONNECTION



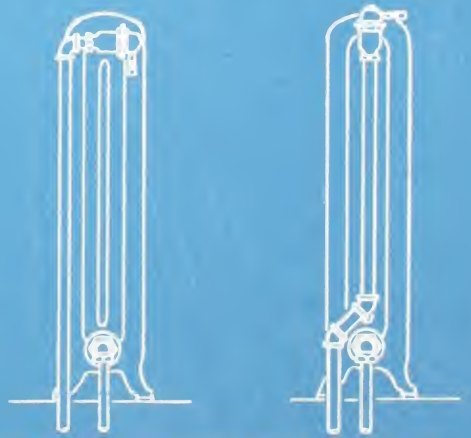
STANDARD VALVE AND THERMO TRAP CONNECTION



BOTTOM CONNECTION USED IN CHURCHES AND SCHOOLS OR WHERE HEAT IS INTERMITTANT



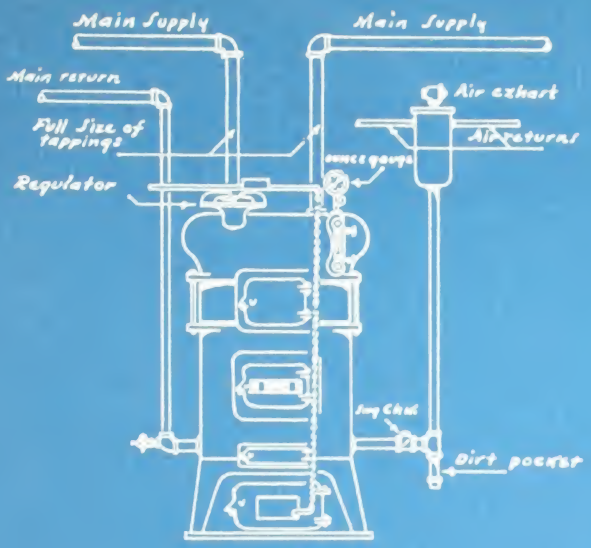
CONNECTIONS USED FOR REMODELLING STRAIGHT STEAM INSTALLATIONS



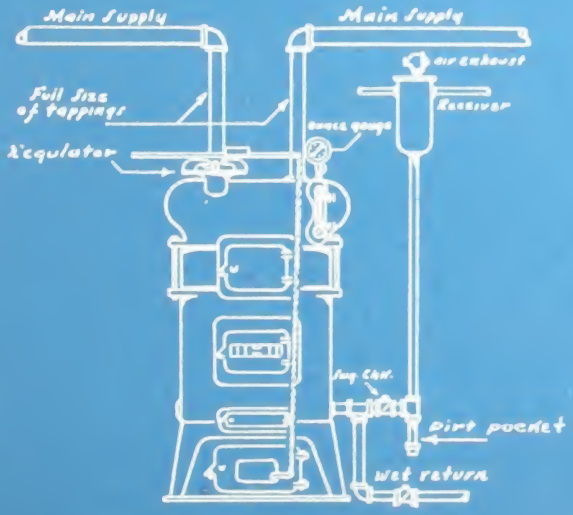
TWO METHODS OF CONNECTING RADIATORS FOR SUPPLY AND RETURN ON SAME END

DETAIL OF TYPICAL BOILER CONNECTIONS I

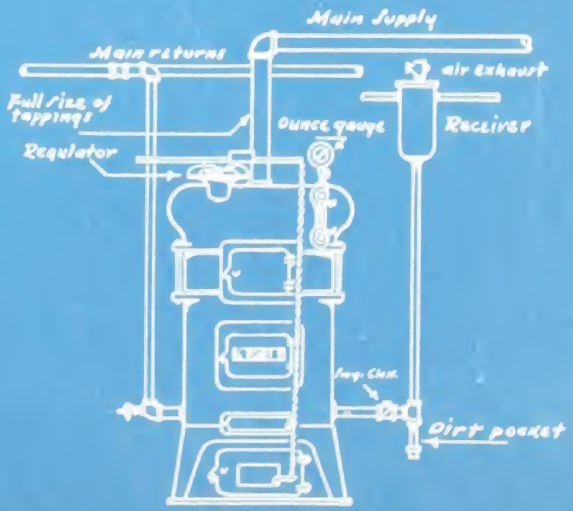
CONNECTIONS FOR ROUND BOILERS USED WITH A TRANE SYSTEM



NO 1

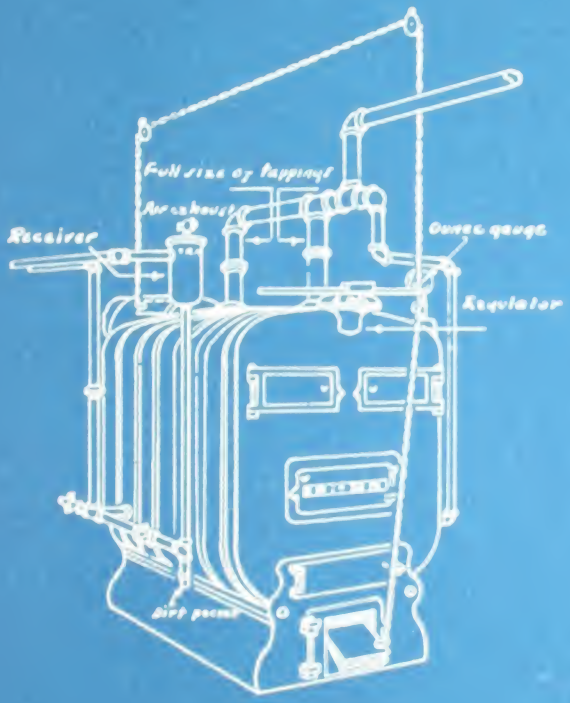


NO2



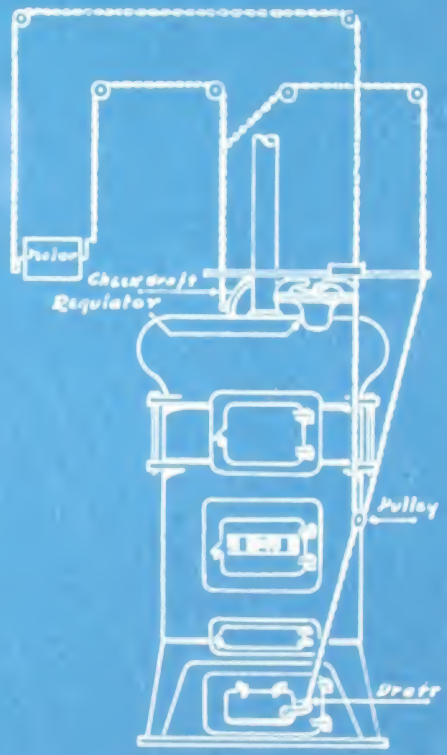
NO3

· DETAIL · OF · TYPICAL · BOILER · CONNECTIONS · II ·



NO 4

· TYPICAL · CONNECTIONS · FOR ·
· SQUARE · BOILER ·



NO 5

THERMOSTAT CONNECTIONS

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